

REMARKS

Claims 1-6 and 8-13 are pending in the application with claims 1, 12 and 13 being the independent claims. Claims 1, 2, 5, 6 and 8-10 are amended. Claim 7 is cancelled, and claims 11-13 are new.

Title of the Invention

The Examiner objected to the title as being non-descriptive. Applicants have amended the title as requested by the Examiner. Accordingly, Applicants respectfully request that the Examiner withdraw the objection.

Objections to the Claims

The Examiner objected to claims 2 and 5-10 for various informalities. The Examiner objected to claim 7 under 37 C.F.R. § 1.75(c) as failing to limit the subject matter of the base claim. Applicants have amended claims 2, 5, 6, and 8-10 to more clearly recite the subject matter of the invention. Applicants have cancelled claim 7. Accordingly, Applicants respectfully request that the Examiner withdraw the objection.

Rejections Under 35 U.S.C. § 112

The Examiner rejected claims 8-10 under 35 U.S.C. § 112, second paragraph as being indefinite. Claims 8 and 9 are amended to overcome the rejection, but not to limit the scope of the claims.

The Examiner rejected claim 10 as reciting a length/time rather than volume/time. Applicants traverse this rejection. In the present application, reference to flow rate is the rate at which the primary (circulating) gas is supplied through the primary (circulating) gas supply holes into the processing chamber. Accordingly, Applicants respectfully request that the Examiner withdraw the rejection.

Rejections Under 35 U.S.C. § 102

The Examiner rejected claims 1 and 8-10 under 35 U.S.C. § 102(b) as being anticipated by JP 409251981A to Kurihara *et al.* (Kurihara).

Claim 1 relates to a processing apparatus comprising a gas supply mechanism that supplies a processing gas into a processing chamber via a plurality of gas supply holes including a plurality of primary gas supply holes and a plurality of circulating gas supply holes, an evacuating mechanism that evacuates the processing gas from said processing chamber, and a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism, wherein said gas supply mechanism includes, a primary gas supply system that supplies primary gas supplied from a processing gas source into said processing chamber via said primary gas supply holes, and a circulating gas supply system that supplies at least a portion of the exhaust gas into said processing chamber via said circulating gas supply holes with said primary gas supply system and said circulating gas supply system constituted as systems independent of each other, and wherein the ratio of the number of said primary gas supply holes and the number of said circulating gas supply holes is set equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas.

Kurihara discloses a semiconductor manufacturing system that includes a chemical cylinder 111 which supplies process gas to a vacuum tub 101 through a nozzle. The flow rate of the process gas is controlled control-of-flow equipment 112. A turbo molecular pump 105 is connected to the vacuum tub, and a recycle line 107

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extends between the exhaust side of the pump 105 and the vacuum tub 101. The rate of the process gas in the recycle line 107 is adjusted by opening a bulb 108.

Kurihara does not disclose all the features of amended claim 1. Accordingly, claim 1 is not anticipated by Kurihara.

Claims 8-10 depend from and add additional features to independent claim 1. As such, claims 8-10 are not anticipated for at least the reasons set forth above.

Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 2-7 under 35 U.S.C. § 103 as being unpatentable over Kurihara. Applicants have combined subject matter of original claim 2 with independent claim 1. Claims 2-7 depend from claim 1. The Examiner states that original claim 2 is unpatentable because the features of original claim 2 would have been obvious in order to have a uniform distribution of supply gas and maintain the ratio of target flows of primary and circulating gases.

However, Applicants traverse such an assertion. Kurihara fails to teach or suggest primary and circulating gas holes in a ratio that corresponds to a target flow ratio as recited in claim 1. Kurihara teaches a nozzle which, as shown in FIG. 5, includes an equal number of holes for flow from a recycle line 107 and flow of the process gas supply from the chemical cylinder 111. The flow rates of the recycle line and the process gas supply line are controlled by control-of-flow equipment 112 and bulb 108, respectively.

The Examiner's assertion that it would be obvious to modify the system of Kurihara to that claimed "in order to have uniform distribution" and "maintain the ratio of target flows of gases" is unfounded.

First, modifying Kurihara to have the ratio claimed would not give uniform distribution because all the recycle holes are on one side of the nozzle while all the process gas supply holes are on the other side of the nozzle.

Second, the flow rates of the Kurihara system are controlled by the control-of-flow equipment 112 and bulb 108. These components, in the absence of evidence to the contrary, maintain flow rates. Accordingly, there would be no motivation to modify the system of Kurihara from that shown. In the present invention, the ratio of holes being equal to the target flow rates allows gases to be supplied at a constant flow rate through all the gas supply holes, thereby assuring uniformity in the processing performed on the workpiece. See Specification, page 5, lines 4-7. Kurihara does not teach or suggest such a hole ratio.

Furthermore, the Examiner relies upon hindsight reasoning when stating that it would be obvious to maintain the ratio of target flows by setting the ratios of gas supply holes and circulating gas holes. Hindsight is not permitted in a proper determination under 35 U.S.C. § 103. The legal conclusion must come from facts in the prior art. See MPEP 2142. In this case, the prior does not teach or suggest, and provides no motivation for modifying Kurihara to have a ratio of a number of primary gas supply holes and a number of circulating gas supply holes set equal to a ratio of a target flow rate for the primary gas and a target flow rate for the circulating gas, as recited in claim 1. Accordingly, claim 1 is allowable over Kurihara. Applicants respectfully request that the Examiner allow claim 1.

Claims 2-6 depend from and add additional features to independent claim 1. As such, claims 2-6 are patentable for at least the reasons set forth above. Accordingly,

Applicants respectfully request that the Examiner reconsider and withdraw the rejection of these claims.

New Claims

Claims 11-13 are new claims. Claim 11 depends from and adds additional features to independent claim 1. As such, claim 11 is patentable for at least the reasons set forth above.

Claim 12 recites a processing apparatus comprising a gas supply mechanism that supplies a processing gas into a processing chamber via a plurality of gas supply holes including a plurality of circulating gas supply holes; an evacuating mechanism that evacuates the processing gas from said processing chamber; and a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism, wherein said gas supply mechanism includes, a circulating gas supply system configured to supply a portion of the exhaust gas into said processing chamber via said circulating gas supply holes, and a second primary gas supply system configured to supply a primary gas supplied from a processing gas source through said circulating gas supply holes, said gas supply system also provided with a means for flow rate adjustment for said primary gas provided at said second primary gas supply system, wherein the hole density of the gas supply holes is set so as to ensure that the back-pressure is equal to or lower than the rated back-pressure of the evacuating mechanism when the primary gas and the circulating gas are supplied at their target flow rates.

Claim 13 recites a processing apparatus comprising a gas supply mechanism that supplies a processing gas into a processing chamber; an evacuating mechanism

that evacuates the processing gas from said processing chamber; and a gas circulating mechanism that returns at least a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism, wherein said gas supply mechanism includes, a circulating gas supply system configured to supply at least a portion of the exhaust gas into said processing chamber via a plurality of circulating gas supply holes, a first primary gas supply system configured to supply a primary gas supplied from a processing gas source through a plurality of primary gas supply holes, a second primary gas supply system configured to supply the primary gas supplied from the processing gas source through said circulating gas supply holes, and means for flow rate adjustment of said primary gas provided at said second primary gas supply system, wherein the hole density of the gas supply holes is set so as to ensure that the back-pressure is equal to or lower than the rated back-pressure of the evacuating mechanism when the primary gas and the circulating gas are supplied at their target flow rates.

Kurihara does not teach or suggest system as claimed in claims 12 and 13. Accordingly, claims 12 and 13 are patentable over Kurihara. Applicants respectfully request that the Examiner consider claims 12 and 13 and pass them to allowance.

Conclusion


Each of the objections and rejections have been overcome, traversed or otherwise rendered moot. Accordingly, the present application is now in a condition for allowance. Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw all the objections and rejections in this application.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: May 14, 2002

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

AMENDMENTS TO THE CLAIMS

Claim 7 is cancelled.

Claims 11-13 are new.

Claims 1, 2, 5, 6 and 8-10 are amended as follows:

1. (Amended) A processing apparatus [having] comprising:

a gas supply mechanism that supplies a processing gas into a processing chamber via a plurality of gas supply holes including a plurality of primary gas supply holes and a plurality of circulating gas supply holes,

an evacuating mechanism that evacuates the processing gas from said processing chamber, and

a gas circulating mechanism that returns[, a] at least[,] a portion of exhaust gas evacuated from said processing chamber to said gas supply mechanism,

wherein[;] said gas supply mechanism [is provided with] includes,

a primary gas supply system that supplies primary gas supplied from a processing gas source into said processing chamber via [a plurality of] said primary gas supply holes, and

a circulating gas supply system that supplies at least a portion of the exhaust gas into said processing chamber via [a plurality of] said circulating gas supply holes with said primary gas supply system and said circulating gas supply system constituted as systems independent of each other, and

wherein the ratio of the number of said primary gas supply holes and the number of said circulating gas supply holes is set equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas.

2. (Amended) A processing apparatus according to claim 1, wherein[;] the hole radius and the hole density of said gas supply holes are constant over the entire surface[; and

the ratio of the number of said primary gas supply holes and said primary number of said circulating gas supply holes is set equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas].

3. (Amended) A processing apparatus according to claim 1, wherein[;] the hole radius of said gas supply holes is constant over the entire surface[;],

wherein the ratio of the area over which said primary gas supply holes are provided and the area over which said circulating gas supply holes are provided is set equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas[;], and

wherein the hole density of said circulating gas supply holes is set so as to ensure that the back-pressure is equal to or lower than the rated back-pressure of said evacuating mechanism when said circulating gas is supplied at the target flow rate.

4. (Amended) A processing apparatus according to claim 1, wherein[;] the hole density of said gas supply holes is constant over the entire surface[;],

wherein the ratio of the area over which said primary gas supply holes are provided and the area over which said circulating gas supply holes are provided is set

equal to the ratio of a target flow rate for said primary gas and a target flow rate for said circulating gas[;], and

wherein the hole radius of said circulating gas supply holes is set so as to ensure that the back-pressure is equal to or lower than the rated back-pressure of said evacuating mechanism when said circulating gas is supplied at the target flow rate.

5. (Amended) A processing apparatus according to [any of claims] claim 1, wherein[;] the ratio of the number of said primary gas supply holes per unit area and the number of said circulating gas supply holes per unit area at said gas supply mechanism is constant over the entire surface of said gas supply mechanism.

6. (Amended) A processing apparatus according to [any of claims] claim 1, wherein[;] the conductance of said circulating gas supply system is set higher than the conductance at said gas supply mechanism.

8. (Amended) A processing apparatus according to [any of claims] claim 1, wherein[;] a buffer space is provided at least at one of said gas circulating mechanism and [/ or] said circulating gas supply system.

9. (Amended) Processing apparatus according to [any of claims] claim 1, wherein[;] a means for filtering said circulating gas is provided at least at one of said gas circulating mechanism and [/ or] said circulating gas supply system.

10. (Amended) A processing apparatus according to [any of claims] claim 1, wherein[;] the rate at which said primary gas is supplied through said primary gas supply holes into said processing chamber [and / or the rate at which said circulating gas is supplied through said circulating gas supply holes into said processing chamber] is set equal to or higher than 500 m / sec.